

WHAT IS CLAIMED IS:

1. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a ceramic substrate;

forming a lower electrode on said substrate;

forming a piezoelectric/electrostrictive layer on said lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

forming an upper electrode on said piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal; and

patterning said piezoelectric/electrostrictive layer and said upper electrode by light exposure after masking said upper electrode in desired pattern.

2. The method in Claim 1, further comprising the step of thermally treating the produced ceramic device at 500-1200 °C.

3. The method in Claim 1, wherein said ceramic is selected among aluminum oxide, zirconium oxide, silicon, silicon carbide, silicon nitride, silicon dioxide and glass.

4. The method in Claim 1, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder, or a mixture prepared by additional mixing of an organic solvent for controlling the material property into said mixture of

ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder.

5 5. The method in Claim 1, wherein said photosensitive resin to form a mixture with metal is a conductive UV adhesive or a transformed material of organic compound making a chelate with said metal.

6. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

10 providing a ceramic substrate;

 forming a lower electrode on said substrate using a mixture of photosensitive resin and metal;

15 forming a piezoelectric/electrostrictive layer on said lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

 forming an upper electrode on said piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal; and

20 patterning said lower electrode, said piezoelectric/electrostrictive layer, and said upper electrode by light exposure after masking said upper electrode in desired pattern.

7. The method in Claim 6, further comprising the step of thermally treating the produced ceramic device at 500-1200 °C.

25 8. The method in Claim 6, wherein said ceramic is selected among aluminum oxide, zirconium oxide, silicon, silicon carbide, silicon nitride, silicon dioxide and glass.

9. The method in Claim 6, wherein said mixture of

photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder, or a mixture prepared by additional mixing of an organic solvent for controlling the material property into said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder.

10. The method in Claim 6, wherein said photosensitive resin to form a mixture with metal is a conductive UV adhesive or a transformed material of organic compound making a chelate with said metal.

11. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a ceramic substrate;

forming a lower electrode on said substrate;

forming a piezoelectric/electrostrictive layer on said lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

masking and exposing said piezoelectric/electrostrictive layer to pattern it;

forming an upper electrode on said piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal; and

masking and exposing said upper electrode to pattern it.

12. The method in Claim 11, further comprising the step of thermally treating the produced ceramic device at 500-1200 °C.

13. The method in Claim 11, wherein said ceramic is selected among aluminum oxide, zirconium oxide, silicon, silicon carbide, silicon nitride, silicon dioxide and glass.

14. The method in Claim 11, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder, or a mixture prepared by additional mixing of an organic solvent for controlling the material property into said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder.

15. The method in Claim 11, wherein said photosensitive resin to form a mixture with metal is a conductive UV adhesive or a transformed material of organic compound making a chelate with said metal.

16. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a ceramic substrate;

forming a lower electrode on said substrate using a mixture of photosensitive resin and metal;

masking and exposing said lower electrode to pattern it.

forming a piezoelectric/electrostrictive layer on said

lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

masking and exposing said piezoelectric/electrostrictive layer to pattern it;

5 forming an upper electrode on said
piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal; and

 exposing said upper electrode to pattern it.

10 17. The method in Claim 16, further comprising the step of thermally treating the produced ceramic device at 500-1200 °C.

18. The method in Claim 16, wherein said ceramic is selected among aluminum oxide, zirconium oxide, silicon, silicon carbide, silicon nitride, silicon dioxide and glass.

15 19. The method in Claim 16, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or
20 similar composition with said ceramic powder, or a mixture prepared by additional mixing of an organic solvent for controlling the material property into said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic
25 powder.

20. The method in Claim 16, wherein said photosensitive resin to form a mixture with metal is a conductive UV adhesive or a transformed material of organic compound making a chelate

with said metal.

21. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a metal substrate;

5 forming a piezoelectric/electrostrictive layer on said metal substrate using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

forming an upper electrode on said piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal;

10 and patterning said piezoelectric/electrostrictive layer and said upper electrode by light exposure after masking said upper electrode in desired pattern.

22. The method in Claim 21, further comprising the step of thermally treating the produced ceramic device at 200-500 °C.

23. The method in Claim 21, wherein said metal substrate is nickel or stainless steel.

24. The method in Claim 21, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder, or a mixture prepared by additional mixing of an organic solvent for controlling the material property into said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic

powder.

25. The method in Claim 21, wherein said photosensitive resin to form a mixture with metal is a conductive UV adhesive or a transformed material of organic compound making a chelate with said metal.

26. A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a metal substrate;

forming a piezoelectric/electrostrictive layer on said metal substrate using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

masking and exposing said piezoelectric/electrostrictive layer to pattern it;

forming an upper electrode on said piezoelectric/electrostrictive layer using a mixture of photosensitive resin and metal; and

masking and exposing said upper electrode to pattern it.

27. The method in Claim 26, further comprising the step of thermally treating the produced ceramic device at 200-500 °C.

28. The method in Claim 26, wherein said metal substrate is nickel or stainless steel.

29. The method in Claim 26, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is a ceramic sol solution containing photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder and a ceramic sol solution of same or similar composition with said ceramic powder, or a mixture

prepared by additional mixing of an organic solvent for
controlling the material property into said mixture of
ultraviolet ray hardening resin and ceramic powder and a ceramic
sol solution of same or similar composition with said ceramic
powder.

30. The method in Claim 26, wherein said photosensitive
resin to form a mixture with metal is a conductive UV adhesive
or a transformed material of organic compound making a chelate
with said metal.